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Florida Caverns

A NATURE-MADE WONDERLAND

by

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Florida is truly a child of the sea, since all the rocks composing its land were formed directly on the ocean bottoms or by streams emptying along the shores. From the record of these rocks we know that Florida has been alternately above and below the sea many times in the geologic past. In fact, the rocks visible in the state park area at Florida Caverns, near Marianna, Florida, and in the caves were formed from the hard shells of animals that lived in one of these seas. As the animals died, their shells accumulated on the sea bottoms, where they were covered by other shells and hardened into lime rock.

These shells, called "fossils" by the geologist, are remains representing cemeteries of the past. Along most of our coastal areas and sea bottoms these shells are accumulating and forming limestone today. Such limestone has formed also in areas many miles removed from the present seas, as in Iowa and other middle western states, telling us where seas have been in the past.

How do we know that these limestones were formed in the sea? The next time you go through the caves at Florida Caverns look closely at the walls and you will be able to find the shells of *Scollops* and other clams. These animals lived only in shallow seas. The most common shell that you will notice will be many small coiled flat shells about the size of barley seed and flat thin disks about the size of dimes and quarters. The animals that formed these shells are known as Foraminifera and have the fancy names of *Operculinoides* and *Lepidocyclina*. They are one celled animals (our most primitive) and are related to some of the parasites that cause disease. These particular animals are extinct and are known only from these rocks. From their association with other shells they are known to have lived in shallow salt-water seas, and by means of them the geologist is able to recognize this particular limestone, even when it has been taken from a well drilled many feet below the ground surface, for these small shells are recognizable even where the limestone has been broken into fine fragments.

The limestone in which the caves of Florida Caverns were carved is known from geologic studies made throughout the state to have been raised from the sea by land movements after being formed and to have been extensively eroded, following which it was again submerged under the sea and other limestone deposited over the eroded surface. These limestones were subsequently raised out of the sea to be eroded. Over this second eroded surface a delta deposit of sand, clay and gravel was formed by streams that emptied into the Gulf of Mexico.

The limestone that you will see in the caves is known as the Ocala limestone, named from deposits near Ocala, Florida. In the region about the Florida Caverns, limestones named the Suwannee limestone and the Marianna limestone overlie the Ocala limestone. These limestones were named for deposits recognized along the Suwannee

This is another view of the WATERFALL ROOM and shows stalactites, stalagmites, columns and cascades in varying forms and degrees of development.—A Florida Park Service Photo.

Stalactites on the ceiling of the JEWEL ROOM, extending into drapes on the right and a cascade of stalactites in the background. The vertical lines of this cascade are controlled by the formation of stalactites and the horizontal lines reflect bedding in the limestone along which these stalactites are formed.—Photo by Cline.

river and at Marianna, Florida. The sand, clay and gravel overlying all of these limestones are not named but are believed to be the same age as deposits of the geologic period popularly known as the "ice age."

Since emerging from the sea for the last time, this part of Florida about the state park area has been undergoing changes constantly. The rocks have been continuously attacked by elements of the weather, and disintegrated where exposed. Running streams carry away much of these products of weathering, but the work of water under the ground is the major factor in the creation of these caves and the deposits in them. This underground water, running through the pores in the limestone, has been and is now wearing away portions of the land. These water channels are isolated along fractures, bedding planes and other structural weaknesses, or along poorly consolidated rock. The water dissolves the limestone and carries it out into surface streams and on to the sea, and as this material is carried away the rock, through which the water flowed to the surface, is being worn away an equal amount. The amount of this material being carried away is illustrated at Silver Springs, one of our larger springs, where each day about 450 tons of rock is carried away dissolved in water. When it is realized that this is only one of thousands of springs in Florida, you can readily see what a large amount of rock is being dissolved from beneath the ground and just how cavernous the rock must be.

Solution of Limestone

The rocks in which the caves of the Florida Caverns State Park were formed are limestone. This rock is made of the mineral calcite, calcium carbonate, and it is soluble in pure water under conditions of favorable structure, a continuous supplying of moving water and lime. However, in the water of Florida this limestone is readily dissolved, because the humid climate and prolific vegetation contribute organic and mineral acids to water and make it a highly potent solvent that is capable of dissolving large amounts of this rock.

Limestone is as a rule jointed vertically and bedded horizontally. Openings along these joints and beds provide easy avenues of travel for water. The ultimate source of all of Florida's ground water is from the rain and precipitates from the air. As this rain water falls through the air it becomes charged with carbon dioxide gas which combines with water to form corbonic acid. On the ground humic acids from rotting vegetation is added. These are the common natural solvents of limestone. A good portion of this acid charged water soaks into the ground, and as it descends through lime rock small portions of the rock are dissolved. However, relatively little solution occurs until sufficient water enters the rock to fill completely all the available pores. In this portion of the rock, saturated with water and bathed with weak acids, solution is most active. Because of the pressure of water entering the rock, ground water tends to move horizontally along bedding planes which offer the easiest exit. Thus, cave systems generally are developed horizontally and one system may lie over another and they may be connected by vertical tubes and rooms.

Any rain water entering the rock from the surface makes its way downward to fill completely all the pores

In the WATERFALL ROOM several stalactites and stalagmites have united to form columns and some have been subsequently modified by cascades of stalactites that look like frozen water falls. The long thin stalactites are hollow.—A Florida Park Service Photo.

Chris MacGill, Associated Press correspondent, takes members of her Girl Scout Troop 22, Tallahassee, on a nature trail hike through the beautiful forests at Florida Caverns.

During the springtime months, the trillium, bloodroot, May apple and columbine, growing amid many beech and silverbell trees, give one the feeling of being in a northern forest, while the evergreen magnolia, the chinaberry, and other flowering trees, keep the air heavy with their fragrance. Two small but interesting palms, the blue-stem palmetto and the needle palm, help maintain the southern atmosphere. Truly northern trees court southern palms at Florida Caverns.—Photo by Chester.

of the rock at some depth. As it moves downward and then into the saturated rock through pores and open spaces it acts as a slow solvent to increase the size of the openings and to connect them to form a continuous system of channels through which streams filling the cavities may run.

As large caverns are formed, solution cavities of irregular shape are gradually cut out and enlarged. Some of these may be expanded to a point near the surface where surface deposits (largely sand in Florida) will collapse into the cavern and a sink is formed. The larger part of Florida's natural lakes, sinks, depressions and ponds are the result of solution of the underlying limestone. These features range from small pits a few feet in diameter to large depressions several miles broad. Many are perfectly round, others are highly irregular. Some are cone-shaped with rocky bottoms, some have broadly developed flat bottoms and are known as prairies. Still others are vertical tubes, only a few inches in diameter in some cases, that extend as much as one hundred feet down into the limestones. These are "natural wells."

Land Movements in Florida

If these caves, we see in the Florida Caverns Park area, were formed under water, how is it possible to walk through them today? This is an obvious question which requires an answer. If rocks formed under marine waters are exposed on the land surface today it is obvious that the land has been raised out of the sea, or the sea has lowered. From geologic evidence it is known that Florida has been rising since late geologic time. This elevation is believed to be caused by downwarping at the mouth of the Mississippi River, where many thousands of box car loads of sediment are dumped each day, accompanied by adjustments in the earth's crust and the elevation of land areas surrounding the delta of the Mississippi River.

Then there is a second cause by which these caves are made dry. Everyone has heard that ice caps the North and South poles of the earth, but few people realize that, if all this ice melted, the level of the sea as it is known today would be higher by about 110 feet. If all polar ice melted, the Chipola River at Florida Caverns, would become a salt bay, Marianna a seaport town, and the beach would be near the park area. However, do not sell your beach property too quickly since this polar ice is known to be melting only a few inches a century.

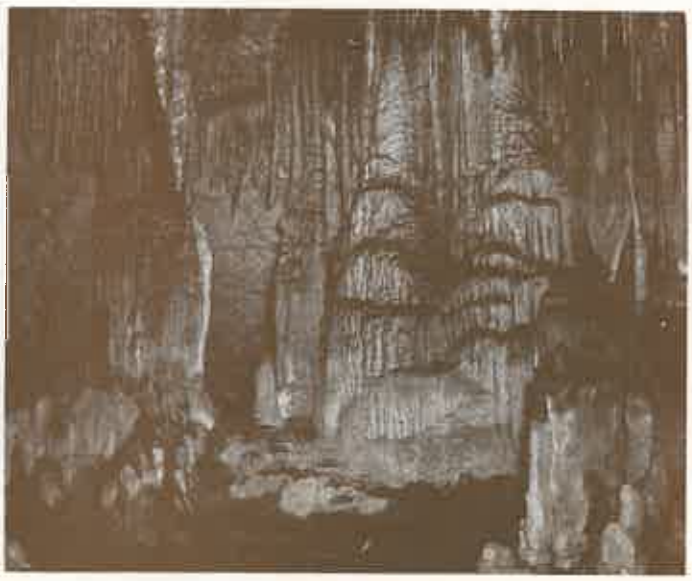
Considering the sub-tropical climate of Florida, isn't it peculiar that ice had so much to do in shaping our land surface? As a matter of record all of the surficial deposits making up the large part of the land surface of Florida were created and shaped during the geologic past (one to ten million years ago) when ice piled up on the poles and moved down over lower latitudes or when this ice was being melted. In the United States as this ice piled up on the North Pole and moved down over most of the middle western states, the water forming this ice came from ocean basins and the water in them was lowered as much as three to four hundred feet. At this time much of the Gulf and Atlantic bottoms was uncovered, land streams cut their valleys much deeper, ground water circulated much more vigorously and rocks through which it passed were dissolved faster. Later as this ice was melted the lower parts of stream valleys were filled with salt water and the streams became sluggish and deposited sediment in their valleys to make their floodplains. Ground-water circulation was retarded and the bottoms of the Gulf and Atlantic were again covered. This uncovering of the bottoms of the Gulf and Atlantic followed by covering constitutes a cycle. Five of these cycles have been recognized in Florida, and the red sands, clay and gravel that make-up the surface of most of Florida represent former bottoms of the Gulf and Atlantic, now raised out of these seas by land movements.

Today we are living in a period following a time the

COLUMNS AND STALAGMITES WITH A BEAUTIFUL AND ELABORATE CASCADE IN THE BACKGROUND.—As these stalagmites developed, they were formed as flat basin-like parts over which water splashed and cascaded to the floor and which were alternately inclined in one direction and then another.—A Florida Park Service Photo.

Cave formations in the TURNIP PATCH. The stalagmite on the right is almost joined with a stalactite. If it does, it will make a column. The grape-like clusters in the upper foreground result when the flow of water is so slow that all of it evaporates from the ceilings and deposits its mineral load there.—Photo by Chester.

STALACTITES AND STALAGMITES IN FLORIDA CAVERNS—Long thin stalactites result when the flow of water is rapid. Some are hollow and are formed around margins of drops of water where evaporation is greatest. These serve as pipes through which water flows to the end of the stalactite. The thicker stalagmites on the floor are formed from water dripping from above and their size and thickness depend entirely on the speed and amount of the water dropping from the ceiling and walls.—Photo by Chester.



It is readily seen from the majestic cascade of stalactites in the background how this room came to be called the CATHEDRAL ROOM. The drape-like stalactites in the background and in the right of the photograph were formed as water ran along a smooth surface and evaporated along an edge rather than from a point.—A Florida Park Service Photo.

northern and southern extremes of the earth were covered by ice, and this ice is still melting off of these areas.

Deposits in Cave

We have seen then in the preceding discussion how caves are formed largely in rocks saturated with water, and how by land movements and changes of sea level the caves and pores formed in this rock are moved above permanent water levels and exposed to air. It then becomes possible to deposit rock in the pores and caves rather than to increase their size by solution. As you go through the caves you will notice that the walls are wet and that water is oozing out of the pores of the rock.

This water has just passed through a limestone and has dissolved parts of the rock. The reader undoubtedly knows that water will dissolve substance in larger quantities and more rapidly if it is hot, and that it can hold more gases to make stronger acids if it is under pressure. So, having been released from a relatively warm rock in which it was under some pressure and where there was little air circulating, into a large cave where rapidly circulating air cools the cave and evaporates the water, this water can no longer hold all the limestone it has dissolved and it releases part of it.

Small drops of water emerging from the lime rock on cave walls are evaporated and calcite and other rock minerals are deposited along these walls. Where these drops cascade along the walls a continuous elongated ridge is deposited. If the water oozes out in an extremely fine coating of water the entire ceiling, walls and floor may be paved with calcite.

Where individual drops collect on the cave ceilings, a thin deposit may be formed on the ceiling after which

The most outstanding landmark in the park is the stone administration building (above) which has been erected near the entrance to the caverns. It was built by hand from the solid rock foundation to the hand-riven cypress shake roof. The walls are built of beautifully weathered native limestone and the shelter roof is supported by hand-hewn timbers prepared on the ground. This building is so constructed that it should be standing and in use for several generations. It serves as headquarters, refreshment house, temporary museum and lounge. Parties, who tour the caverns, join guides here and return after the tour. The building is equipped with modern utilities.—Photo by "FNPS."

the remaining water may drop to the cave floor where more calcite is deposited. Continuous dripping results in paired deposits extending down from the ceiling and up from the floor. The deposit on the floor is commonly thicker and more columnar, whereas that on the ceiling is thin and tapering much like an icicle. Those hanging from the ceiling are called *stalactites* and those on the floor are *stalagmites*. Where these two deposits are joined they are known as a *column*.

These cave formations are all composed of the mineral calcite, which forms all lime rock. If you will notice in the cave this mineral is crystalline, and it is remarkable that as calcite crystallizes from the many individual drops of water it is arranged always in a particular pattern. These crystal faces reflect light and form the many unusual and beautiful arrangements which you will see in a visit to the caves.

In addition to its geological attractions, the area in which Florida Caverns is located is of peculiar interest biologically. In it are found many species of both plants and animals that are not expected so far south, as well as a large number of typically southern forms.

Florida Caverns State Park occupies a strategic place in Florida. At present it is our most westerly State Park and it serves as the gateway to our State Park system for tourists entering the State from the northwest and west.

The State Park system of Florida has been developed as a coordinated group of Parks, each one of which stands upon its own merits and each one possessing as many as possible of the following values: Outstanding historic, scenic and scientific attractions. Florida Caverns is richly endowed with them all.

Henry Mayo, veteran guide at Florida Caverns, explains the lore of the caves to members of the Geography club of Florida State University, Tallahassee, during a student-tour through this nature-made wonderland.—Photo by Chester.

I hope that you have found this discussion of the creation of lime rock, the formation of caves under water, the elevation of these caves above permanent water levels and the subsequent deposition in them, of interest. . . We of the Florida Geological Survey and Florida Park Service hope that you enjoy your visit to the Florida Caverns State Park.

Where several stalactites join, they form great sheets that resemble draperies. These result where evaporation occurs over a considerable area on sloping walls and single drops are not formed; or where the water evaporates from a ledge rather than from a point.—A Florida Park Service Photo.

Student group at the WISHING WELL, a pool formed in a basin created by deposits on the floor of the cave. Note the very rough stalagmites in the right of the photograph. These rough and branching deposits extending out from the main mass probably resulted from impurities in the water that caused the direction of crystal growth to be slightly modified.—Photo by Chester.